

Some new earthworms of the genus *Amyntas* (Oligochaeta: Megascolecidae) with male discs from Bogildo Island, Korea

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Some new earthworms of the genus *Amyntas* (Oligochaeta: Megascolecidae) with male discs from Bogildo Island, Korea. - Three new *Amyntas* are described from Bogildo Island, Korea: *Amyntas angulatus* sp. nov., *Amyntas jamesi* sp. nov., and *Amyntas yunseondoi* sp. nov. *Amyntas angulatus* sp. nov. have two pairs of spermathecal pores intersegmental in 5/6, and 6/7. The other 2 species have three pairs of spermathecae in VI, VII, and VIII, the former with spermathecal pores intersegmental in 5/6, 6/7, and 7/8, the latter intrasegmental in VI, VII, and VIII. These species have disc-shaped male pore region and simple intestinal caeca. Descriptions of the new species are provided.

Keywords: Earthworms - *Amyntas* - Megascolecidae - Oligochaeta - Korea - taxonomy.

INTRODUCTION

Amyntas has been long known to have more species than any other genus of the *Pheretima*-complex (Sims & Easton, 1972). Korean Megascolecidae also belong to *Amyntas* and many new species have been described recently further expanding this large genus (Hong & James, 2001ab; Hong & Lee, 2001; Hong *et al.*, 2001). Beginning with Kobayashi (1934), Korean earthworms have been studied repeatedly, but the work is not yet completed since much area remains to be collected. There is little overlap between the area sampled for this paper and areas covered by previous studies of Korean *Amyntas*. In all probability, other mountains and other islands have diverse faunas, thus the number of endemic species known in Korea will increase even more.

Genital papillae of the male pore region, especially the male disc, are useful for classification of *Amyntas* and have been used throughout the history of the genus. However, not many species have male discs, a particularly large form of genital papillae or male porophore. Species with male discs are also represented by small numbers of individuals. In this paper, I describe 3 species with male discs: *Amyntas angulatus* sp. nov., *Amyntas jamesi* sp. nov., and *Amyntas yunseondoi* sp. nov. Material was found from litter layers and soils in forests by hand sorting.

The Bogildo Island, one of the six major counties, is located at the southern end of Wando-gun. Among its big mountains are Jeogja peak (435 m), Gwangdae peak

(311 m), and Mangwol peak (350 m), while most areas have an altitude less than 300 m. The mean temperature during the coldest winter month January was 0.5 °C. Summer temperatures reach a mean of 28.8 °C in August and thereafter decrease. The annual mean precipitation is 1456.8 mm (by Korea Meteorological Administration). Holotype and paratypes are deposited in the Korean Bioresources Collection (KB), National Institute of Biologocal Resources.

DESCRIPTIONS

Amynthas angulatus sp. nov.

Figs 1A-C

MATERIAL: Holotype: Clitellate specimen: Korea, Jeollanam-do province, Wando-gun, Bogildo Isl., litter layers in forest, 19 July 2000, Y. Hong coll. Paratype: one clitellate: Same data as for holotype. Other material: Same data as for holotype, 1 a clitellate specimen.

ETYMOLOGY: The name *angulatus* is Latin for “angular” here referring to the shape of the genital papillae.

DIAGNOSIS: Paired spermathecal pores in 5/6, 6/7; male pores XVIII at posterior corner of large angular papillae, each pad extending to 17/18 and 18/19, each papilla hardened.

DESCRIPTION: Worm unpigmented. Dimensions 86 (aclitellates 71-86) mm by 4.5 mm at segment X, 5.2 mm at XXX, 4.7 mm at clitellum; body cylindrical throughout, segments 85. Setae regularly distributed around segmental equators, numbering 71 at VII, 92 at XX; 2-3 between male pores; setal formula AA:AB:YZ:ZZ = 1:1:1.5:2 at XIII. Female pore single in XIV, 0.3 mm. First dorsal pore in 12/13. Clitellum annular in XIV-XVI; setae visible externally.

Male pores in XVIII at posterior corner of large angular papillae with dimensions 1.7 x 2.0 mm with big ring 2.0-3.0 mm outer dimensions, each pad extending to 17/18 and 18/19, each papilla hardened, with seminal groove of variable shape in clitellates, oval, round. Paired spermathecal pores in 5/6 and 6/7, unrecognizable. Genital markings lacking.

Septa 5/6 thin, 6/7 thick, 7/8 thin, 8/9, 9/10 absent, 10/11-13/14 thin. Gizzard in VIII-X. Intestine begins in XV. Typhlosole as simple fold from XXVII. Intestinal caeca simple, originating in XXVII, and extending anteriorly about to XXIII, each consisting of a finger-shaped sac. Esophageal hearts four pairs in X-XIII. IX lateral.

Ovaries in XIII. Paired spermathecae in VI, VII; each ampulla as a flattened, blunt, oval pouch, duct shorter than ampulla, diverticulum coiled and kinked with short muscular stalks; no nephridia on spermathecal ducts. Male sexual system holandric, testes and funnels enclosed in ventral paired sacs in X and XI. Seminal vesicles, two pairs in XI and XII: those of XI enclosed in testis sacs. Prostates in XVIII extending to XVII-XXI; both glandular portions consist of three main lobes, deeply divided in slender leaflets; vas deferens not muscular. Genital papillae glands lacking.

REMARKS: *Amynthas angulatus* sp. nov. keys to the *morrissi* group in Sims & Easton (1972), which is composed of 30 species. Among them, the following Korean species are reported: *A. fibulus fibulus* (Kobayashi, 1936), *A. fibulus ranunculus* (Kobayashi, 1936), *A. kobayashii* (Kobayashi, 1938), and *A. koreanus* (Kobayashi, 1938). In the shape of the male discs *Amynthas angulatus* sp. nov. is similar to *A.*

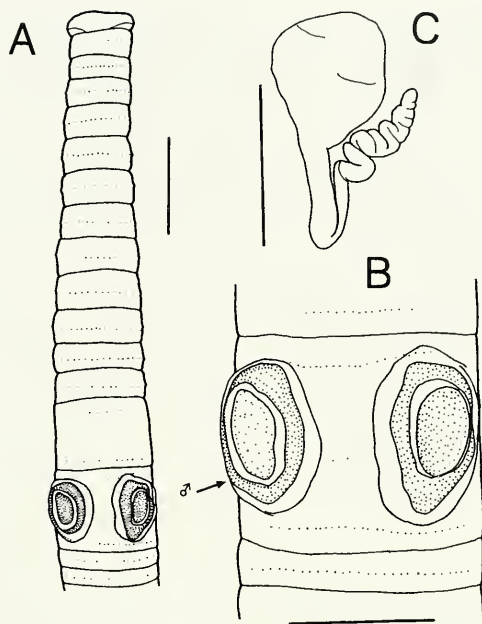


FIG. 1

Amynthus angulatus sp. nov. (A) Ventral view. (B) Male pore region in XVIII. (C) Spermathecae. Scale bars = 5 mm (A), 2 mm (B, C).

kobayashii, but it differs in the male pore region. *A. kobayashii* has clear male pore, but in *Amynthus angulatus* sp. nov. it is unrecognizable on the male discs. *A. fibulus fibulus* and *A. fibulus ranunculus* have different male discs. After Sims & Easton (1972), two species of the *morrissi* group were recorded from Korea, *A. geojeinsulae* (Song & Paik, 1970b) and *A. draconis* Hong & James, 2001. The new species appears to be related to *A. draconis*, but is distinguishable easily by the shape of the male pore region. Its male discs are angular, while *A. draconis* has round discs. Also, *Amynthus angulatus* sp. nov. differs from *A. draconis* in having more setae in VII and XX, shorter body, more closely spaced ventral and dorsal gap, and coiled diverticula.

Chen (1933, 1936, 1938, 1946) recorded 12 species of *morrissi* group from China. Among them, two species have discs-shaped male pore regions: *A. hainanicus* (Chen, 1938) and *A. oculus* (Chen, 1938), but these discs are quite differently shaped than in *Amynthus angulatus* sp. nov.

***Amynthus jamesi* sp. nov.**

Figs 2A-C

MATERIAL: Holotype: Clitellate specimen: Korea, Jeollanam-do province, Wando-gun, Bogildo Isl., Buyong-ri, Jeokjabong, litter layers in forest, 19 July 2000, Y. Hong coll. Other material: Same data as for holotype, 1 acitellate specimen.

ETYMOLOGY: Named after Dr Samuel W. James, who made great contributions to systematics of earthworms.

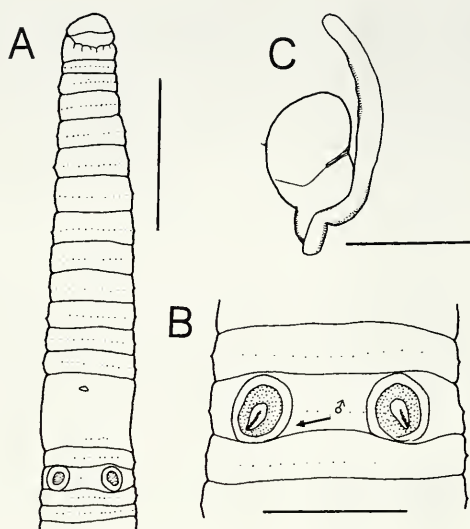


FIG. 2

Amynthus jamesi sp. nov. (A) Ventral view. (B) Male pore region in XVIII. (C) Spermathecae. Scale bars = 5 mm (A), 3 mm (B, C).

DIAGNOSIS: Three pairs of spermathecal pores in 5/6-7/8; male pores at lateral margins of ventrum in XVIII; disc shape resembles a droplet placed with its narrow end laterally, central axis with a diagonal seminal groove; distance between male pores 1.8 mm.

DESCRIPTION: Worms unpigmented. Dimensions 59-63 by 2.5-2.8 mm at segment X, 3.0-3.5 mm at XXX, 2.8-3.0 mm at clitellum; body cylindrical throughout, segments 88-102. Setae regularly distributed around segmental equators, numbering 32 at VII, 46 at XX; 3-5 between male pores; setal formula AA:AB:YZ:ZZ = 2:1:2:3.5 at XIII. Female pore single in XIV, 0.3 mm, oval. First dorsal pore in 12/13. Clitellum annular in XIV-XVI; setae at XVI visible externally within clitellum.

Male pores at lateral margins of ventrum in XVIII, as superficial bright spots near lateral margins at the median ends of seminal grooves within small male discs; disc shape resembles droplet placed with narrow end laterally, their central axis with a diagonal seminal groove, distance between male pores 1.8 mm. Three pairs of spermathecal pores in 5/6-7/8, inconspicuous, small, ventral. Genital markings absent.

Septa 5/6-7/8 thin, 8/9 absent, 9/10 present as sac enclosing testes and funnels; 10/11-13/14 thin. Gizzard globular in VIII-IX. Intestine begins in XV. Typhlosome medium, from XXVII. Intestinal caeca simple, originating in XXVII, extending anteriorly to about XXV, each consisting of one finger-shaped lobe. Hearts X-XIII esophageal, IX lateral.

Ovaries in XIII. Three pairs of spermathecae in VI, VII and VIII; each ampulla as a small broad oval pouch, ducts shorter than ampulla; diverticula slender, stalked, with long sausage-shape chamber, longer than ampulla; no nephridia on spermathecal

ducts. Male sexual system holandric, testes and funnels in paired sacs in X and XI. Seminal vesicles, 2 pairs in XI and XII, slightly developed. Prostates in XVIII, extending to XVII-XXII; ducts long, muscular, both glandular portions consisting of two main lobes, each lobe divided into leaflets.

REMARKS: The present species keys to *hawayanus* (*gracilis*) group by the three spermathecal pores in 5/6-7/8. After Sims & Easton (1972), the Korean species of this group are *A. acinctus* (Goto & Hatai, 1899), *A. agrestis* (Goto & Hatai, 1898), *A. carnosus* (Goto & Hatai, 1899), *A. hilgendorfi* (Michaelsen, 1892), *A. kamitai* (Kobayashi, 1934), *A. serratus* (Kobayashi, 1936), and *A. vallis* (Kobayashi, 1936). These species all have quite different characters from *Amyntas jamesi* sp. nov., such as manicate caecae and different male field configurations. Later on, two more species of the group were recorded in Korea, *A. palgongensis* Hong, 2001 and *A. minjae* Hong, 2001.

The new species is similar to *A. minjae* Hong, 2001 in the male pore region and number of spermatheca, but has a different shape of the spermathecal diverticulum, a longer diverticulum relative to the ampulla, obvious seminal grooves on male discs, and fewer setae per segment at VII and XX.

Chen (1933, 1936, 1938, 1946) recorded 10 species of this group in China. *Amyntas jamesi* sp. nov. is similar to the Chinese *A. muticus* (Chen, 1938) and *A. magnificus* (Chen, 1936) by the male pore region, but is separated easily by the disc-shape and diverticulum.

Amyntas yunseondoi sp. nov.

Figs 3A-C

MATERIAL: Holotype: Clitellate specimen: Korea, Jeollanam-do province, Wando-gun, Bogildo Isl., Buyong-dong, Bojuksan, litter layers in forest, 19 July 2000, Y. Hong coll.

ETYMOLOGY: Yun Seon-Do (1587-1671) who was the master of the Korean literary circle in the age of Chosun Dynasty built a pavilion at his place of residence in Bogildo Island.

DIAGNOSIS: Spermathecal pores in VI, VII and VIII close to 5/6, 6/7 and 7/8; male pores superficial at median ends of seminal grooves within paired discs; disc shape resembles droplet placed with its narrow end posterior, central axis with longitudinal seminal groove; distance between male pores 6.5 mm.

DESCRIPTION: Worm unpigmented. Dimensions 156 mm by 7.0 mm at segment X, 7.0 mm at XXX, 8.2 mm at clitellum; body cylindrical throughout, segments 126. Setae regularly distributed around segmental equators, numbering 51 at VII, 69 at XX; 14 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 5:3:4:5 at XIII. Female pore single in XIV, 1.0 mm wide, oval, slightly invaginated. First dorsal pore in 12/13. Clitellum annular in XIV-XVI; setae invisible externally in the clitellum.

Male pores superficial at median ends of seminal grooves within paired, elevated hardened male discs; disc shape resembles droplet placed with narrow end posterior, raised above body wall level, central axis with longitudinal seminal groove, lateral end posterior to medial end, distance between male pores 6.5 mm. Spermathecal pores in VI, VII and VIII close to 5/6, 6/7 and 7/8, above mid-lateral level, on slightly elevated conspicuous small bumps, pore opening appears black.

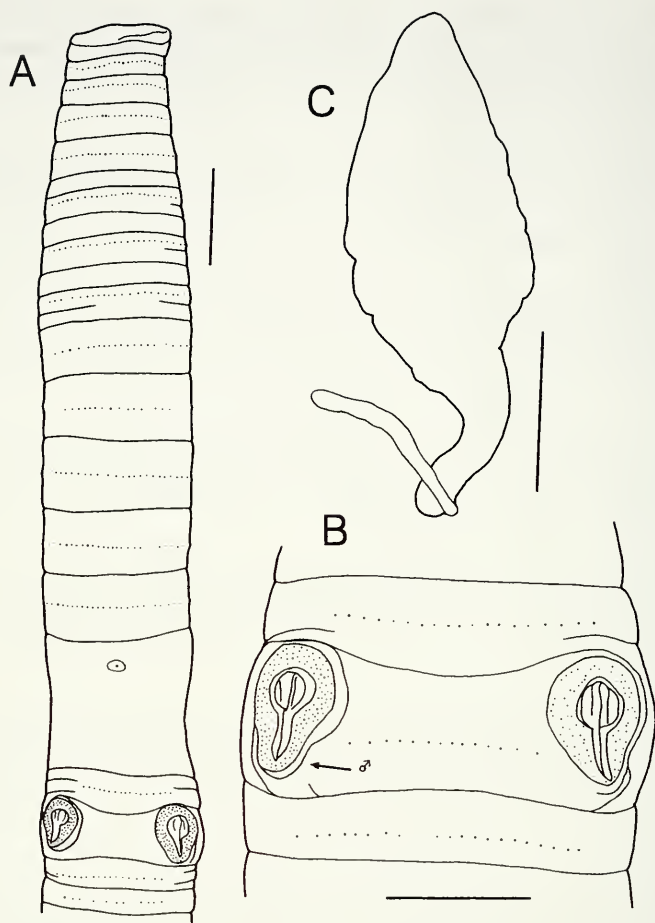


FIG. 3

Amynthus yunseondoi sp. nov. (A) Ventral view. (B) Male pore region in XVIII. (C) Spermathecae. Scale bars = 5 mm (A), 3 mm (B), 2 mm (C).

Septa 5/6-7/8 thick, 8/9, 9/10 absent, 10/11 moderately muscular, 11/12, 12/13 thick, 13/14 thin. Gizzard globular in VIII-X. Intestine begins in XV, small paired lymph glands from XXVIII along dorsal vessel. Typhlosome medium as a simple fold from XXVII. Hearts in X-XIII esophageal; in IX lateral, on the left side larger. Intestinal caeca simple, originating in XXVII, and extending anteriorly about to XXIV, each consisting of a finger-shaped sac with many small pouches on vertical margin.

Ovaries in XIII. Paired spermathecae in VI, VII and VIII; ampulla as a small pouch, ducts shorter than ampulla, of medium thickness; diverticula slender, consisting of digitate chamber with narrow stalk, shorter than ampulla. Male sexual system holandric, testes and funnels in ventral paired sacs in X and XI. Seminal vesicles two pairs in XI and XII, well developed. Prostates in XVIII, divided in many long slender

lobes extending to XVII-XIX, many pieces; vas deferens muscular, clearly single. Genital marking glands lacking.

REMARKS: The species is similar to *A. deogyusanensis* Hong & James, 2001, with respect to the shape of male pore region. It differs from *A. deogyusanensis* in the orientation of the male disc's droplet shape head direction and location of the male pores. *Amyntas yunseondoi* sp. nov. also differs from *A. deogyusanensis* in having more setae per segment at VII and XX, greater length, and more widely spaced ventral and dorsal gap. *Amyntas yunseondoi* sp. nov. has three pairs of spermathecal pores in VI-VIII, but *A. deogyusanensis* has two pairs of spermathecal pores in VI-VII, also lacks genital markings but has conspicuous genital patches, while the new species has neither genital markings nor genital patches. The sampling locality of *Amyntas yunseondoi* sp. nov. is an island of southern Korea, but *A. deogyusanensis* was collected from Mt. Deogyu of the central mainland Korea.

Amyntas yunseondoi sp. nov. keys to the *bournei* group with three pairs of spermathecal pores intrasegmental in VI-VIII. This group is composed of four species; *A. bournei* (Rosa, 1890), *A. domosus* (Chen, 1946), *A. mucrorimus* (Chen, 1946), and *A. sulcatus* (Gates, 1932). After Sims & Easton (1972), one species recorded in Korea, *A. payeiensis* Hong, 2001, but it differs by the seminal grooves within the male discs (Hong *et al.*, 2001).

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